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ABSTRACT

The purposes of this paper are to compile and describe the published empirical studies that have examined nonverbal visual production variables, to offer a critique of the lines of inquiry, and to suggest some areas for continued research. The studies are presented in two major sections: intravisual and intermedia. The intravisual section discusses studies that have compared variable manipulations within one medium. Its subcategories include: (1) color versus black and white presentations, (2) camera angle, (3) nonverbal expressions, (4) movement, (5) complexity, (6) lighting, (7) image size, and (8) transition devices. The intermedia section discusses studies that have tried to compare one medium with another. Its subcategories include print versus picture media, audiovisual versus print media, audio versus visual media, and video versus print media. (FL)

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CHANNEL EFFECTS AND NON-VERBAL PROPERTIES OF MEDIA MESSAGES:

A STATE OF THE ART REVIEW

by

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Paper presented at Speech Communication Association Convention, New York, November, 1980.

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The purpose of this paper is two fold: (A) to compile and describe as comprehensively as possibe the published emperical studies which have examined non-verbal visual production variables and (B) to offer a critique of the lines of inquirey and suggest some fruitful areas for continued research. We have attempted to include all known published studies which have dealt with some non-verbal-visual aspect of media manipulation and its effects on viewers. We have only examined those studies which have gathered viewer response data in conjunction with some experimental control. Our search has taken us through all the standard reference works including the computer based ERIC system and social science index. In the process of generating key words in order to identify potentially appropriate studies, decisions were made to include or not to include certain potentially descriptive terms. In other words, we may have missed some studies because of the descriptors used. Not included in this report are unpublished studies, convention papers and research reports. While we recognize this is a decided weakness as to the comprehensiveness of the work, time and effort did not permit the identifying and gathering of the vast array of unpublished studies in this area.

The studies are presented in two major sections: Intra Visual and Inter Media. The Intra Visual category presents the studies which have compared variable manipulations within one medium. The sub categories include: color vs. black and white, camera angle, complexity, non verbal expressions, movement, lighting, image size, and transition devices. The Inter Media category presents those studies which have tried to compare one medium to another. Included in this category are: print vs. pictures, audiovisual vs. print, audio vs. visual, audio vs. video vs. print.

We have further attempted to generate propositions which summarize the

weight of the research evidence in each sub category. The number of studies which support or do not support each of the propositions are identified and summarized.

The thrust of most of this research has been to identify appropriate use of the media for purposes of instruction. Well over two thirds of the studies examined have used some measure of learning as the primary dependent measure.

As will become apparent in the review, we are not particularly smitten with the operationalization of viewing which has been made in most of the studies. Our knowledge as to the importance and effect of much of the non verbal production variables on viewing response is tremendously limited because recall has been the predominant dependent measure.

INTRA VISUAL

People tend to evaluate color presentations more favorably than they do black and white presentations. Four studies offer support for this proposition, two do not support it.

Support. Rodisill (1952) reported that the addition of color to an illustration proves satisfying to a child to the extent that it helps the child increase his/her perception of realism. Scanlon (1970) analyzed open-ended interviews after subjects viewed either a black and white or a color presentation of a sports event or a funeral. The color group was more aware of color and made twice as many references to it. The black and white group paid more attention to the commentators and wrote longer reports. The color group, however appeared more "moved" by the funeral; their reports contained more emotional content. Strongest support for this propisition is offered by Katzman and Nyenhuis (1972). They reported that color resulted in presentations

being rated more interesting and more active. In a similar vein, Spaulding (1956) concluded that color added to potential interest in illustrations, but that it must be used realistically or functionally.

Non Support. A study by Everett (1978) offered some support for the proposition, and some conflicting evidence as well. Everett found that affective responses to black and white vs. color slides indicated that the presence/absence of color had no effect on the evaluation, potency, activity, and color dimensions. The content of the slide affected the direction of the response, he concluded, and the absence or addition of color affected the degree of appraisal. In a rather old study, McCoy (1962) noted that college students reported that black and white films are viewed as more likely to be real. The weight of evidence appears to support the proposition that affective responses are enhanced by color presentations. This is consistent with what we know of information processing. Since color offers more information and differentiation than black and white, the potential to arouse more senses is present. Everett's study puts the evaluation in the needed prespective, however. In and of itself, the mere presence of color in no way will guarantee higher positive evaluations--they might also be higher negative evaluations.

Black and white presentations are superior to or not significantly different from color presentations for "learning" purposes.

Support. Rosenstein and Kanner (1961) found no significant difference in recall scores between subjects who viewed color as opposed to black and white educational films. This has been the "conventional wisdom" of much of the practise of media materials for the class room. Dooley and Harkins (1971), for example, noted that the addition of color to graphic material in several conditions did not increase effectiveness of the materials in terms of learning. Spaulding (1956) noted

that the addition of color could detract from the communication potential of a message. In a recent study by Johnson and Robertson (1979) this wisdom was seemingly updated. They reported that color did not make a significant difference in factual learning from 16 mm sound films in four different age groups (adults, high school students, sixth graders, and first graders). A variety of other studies have found no difference between black and white and color under some conditions though not all (Booth, 1972; Katzman and Nyenhuis, 1972; Dwyer, 1971; Dwyer, 1970; Chan, Travers and Modfrans, 1965). The weight of evidence in these last four studies have generally been interpreted, however to challenge the evidence of this proposition.

Non Support. Katzman and Nyehuis (1972) concluded that color does produce increases in recall of peripheral (not relevant to basic information, message, plot, theme, etc.) nonverbal material. Dwyer in two different studies found support for the superiority of color. He reported that for specific objectives the addition of color to certain types of illustration, ofr students in specific grade levels, can improve achievement (1970). He also offered evidence that color can improve effectiveness of visual illustration used to compliment oral instruction (1971). Chan, Travers and Modfrans (1965) concluded that color does appear to make a significant difference in the learning of nonsense syllables when presented both visually and auditorially. Booth (1972) found support for color's superiorityin learning from films for sixth graders only. Some non support for this proposition may also be seen in Schaps and Guest's (1968) study which concluded that color increases recall of commercials whether color commercials are presented in black and white film or black and white commercials are presented in a color film. Color commercials in a black and white film

elicited more recall than color commericals in a color film.

That alternative explanations abound for the conclusions of many of these studies is hopefully apparent. The presence or absence of color is a non-cognitive construct. That it should directly effect strict cognitive measures like recall and learning in all circumstances is asking "too much". The fact that most studies which find that there are differences in color's favor, find these differences in specific circumstances, with specific topics or kinds of material most revealing. So many confounding factors surround this controversy. Color television is now common place and part of the frame of reference of most people. This fact alone renders much of the past research of little relevance to today.

Color presentations are superior to black and white presentations for purposes of gaining attention.

Two studies tend support the notion that color is a superior attention getter. Dooley and Harkins (1971) found that the addition of color to graphic material tended to increase attention. Fleming and Sheikhian (1972) reported that color illustrations are represented in the child's mind more rapidly (though no more accurately) than black and white illustrations, especially when they have been presented for a longer period of time (i.e. 24 seconds).

If one wanted to choose up sides for color or black and white, one thing appears evident--it depends what game you're playing. Color is rated generally superior to black and white for purposes of attention and affect...but is not necessary to simply increase recall scores.

INTRA VISUAL -- CAMERA ANGLE

High or low camera angles differently effect receivers judgements of a source. Four studies offer varying support for this non directional proposition.

Tiemens (1970) found minimal support for the principle that camera angle influences perceived credibility of speakers. Mandell and Shaw (1973) found a definite trend that people shown in TV newsfilms are rated most potent when camera angles were low. McCain, Chilberg and Wakshlag (1977) reported the results of two experiments. Higher camera angles consistently produced higher credibility ratings for TV speakers than criterion and low angle shots. In the second study they found support for higher camera angle sequences increasing credibility of a TV newscaster on several dimensions. They also found that higher camera angle sequences increased the task attractiveness of the TV newscasters.

It appears that perceptions of a televised source's credibility is influenced positively by high angles, but that a televised source's potency and authority may be influenced by low angles.

INTRA VISUAL -- COMPLEXITY

Complexity of visuals is negatively related to learning. Two studies support the proposition, two studies offer evidence of non support.

Support. Spaulding (1956) concluded that illustrations communicating specific detail are most effective when: (1) number of objects in the picture are kept to a minimum and (2) number of separate actions needed to correctly identify messages are kept to a minimum. Dwyer (1971) concluded that simple line drawings are more effective learning aides than more complex/realistic visuals.

Non Support. Jorgensen (1956) reported no difference in information gain from three different newscasts: newscaster alone, newscaster with still pictures, and newscaster with moving pictures. In a recent study Borg and Schyller (1979) noted that complexity of background details in visuals did not affect achievement

in a sample of 80 soldiers.

Wartella and Ettema (1974) found that younger children show most differentiation in attention when the complexity of commercials was varied. This is an area where a great deal of current research is focusing attention. One other study dealing with complexity was identified.

Our review of this construct has been limited by the range of materials we have examined for this study. The complexity of the visual field and its relationship to human performance, perception, and reaction time or recognition were not included in our review. Robert Travers (1970) has summarized some of the unpublished work in this area in his book Man's Information System.

INTRA VISUAL -- IMAGE SIZE

Image size (close-up, medium shot, long shot, etc.) is NOT independently related to viewer response.

Support. Williams (1965) reported that static medium shots (not close-up or long shots) maintained throughout a program may cause the audience to be just as interested in the program as though cutting between different shots had been practiced. In 1968, Williams reported that the use of close-ups did not significantly affect interest level for film, though loose shots tended to decrease attention among viewers. Once again, Williams studied this phenomenon in 1972 and concluded that the use of close-ups does not increase attention to film (Williams and Debes, 1971). Wurtzel and Dominick varied the setting and image size in their study (1971). They concluded that close-ups were viewed significantly more positively when the acting style was appropriate for theater rather than for television.

The proposition suggests that a number of factors interact with image

size in determining audience response. Little published research has attempted to unpack what these factors might be. It is an area of needed research, since the most recent research is already nine years old.

INTRA VISUAL -- FORMAT/TRANSITION DEVICES

Cutting rate is associated with some viewer responses. One study supports, one study did not support.

Support. Penn's (1971) excellent study concluded that cutting rate sometimes may be an important variable in the perception of potency. Increase in cutting rate is associated with increase in perceived activity. Accelerating cutting rates for human images (as opposed to cars) increased perception of potency. Decelerating cutting rate lead to decreased potency and activity ratings.

Non Support. Williams and Debes (1971) found that the use of cutting did not increase interest in their treatment film.

There are developmental and cognitive differences in children's abilities to comprehend material presented in different televised formats and conventions. Three studies support the proposition.

Support. Salomon and Cohen (1977) examined the effects of holding content constant but varying formats (fragmentation of space, logical gaps, close-ups, zooming) in television. They found differential patterns of correlation between initial skill mastery and knowledge acquisition within each format, depending on whether a format called upon a new skill or supplanted it. This study was an extension of Salomon's (1972) earlier work which showed that using a technique (zooming) that models an, as yet unlearned mental process (singling out details), is more effective than using a technique that does not model the process (showing slide and then close-up of detail). Salomon's work has been done almost exclusively with children. Firth and Robson (1975) reported that

children who saw a film edited according to the rules of directional continuity specified by Hollywood cinema (preservation of direction of movement across shots) were better able to reconstruct what they saw than those who saw the same film edited with disregard to this principle of continuity. Schlater (1969) offers mixed evidence that television formats and "mistakes" have varying levels of intrusion.

Although this proposition is extremely broad, and offers but scant evidence in its support, it is the area of much current research. Salomon's work is having a great influence in education departments, and is dealing with the technical aspects of video as factors of importance to learning.

INTRA VISUAL -- NONVERBAL EXPRESSIONS

Nonverbal expressions effect the audiences' evaluation of a visualized source. Four studies offer support.

Henyen (1970) reported that non-verbal elements in a picture (expression of rider and horse, control of situation, slope of a drop of a cliff) can influence perception of danger when comparing treatments of maximum fear and danger of those showing maximum safety and escape. As in earlier studies, eye contact by motion picture, television and still photography did not improve instruction or increase opinion change, according to Tankard's (1970) study. Tankard did find that audience perceptions of a performer were influenced by varying eye contact. In a more recent study, Tankard (1977) reported that raised eyebrows at the end of a story by television newscasters are interpreted as a sign of bias when compared to the lack of such a cue. Although the smile was not interpreted as a sign of bias, it did influence two of Merhrabian's dimensions of nonverbal communication: annoyed-pleased, and dominant-submissive. Davis (1978) reported that public figures should avoid direct eye contact with

the camera in order to increase their credibility ratings.

The problem with this nonverbal research with media is that it misses a tremendous amount of research in facial expressions which have been carried out without the specific media connection. The reader who is interested in exploring this topic needs to search other sources of information.

INTRA VISUAL -- MISCELLANEOUS

A variety of studies defy classification, not because they are good or bad, but because they represent specialized interests in the examination of comparing aspects of the visual process.

Hayman (1963) reported that students who sit in the back or in the center of a room in television instruction, perform better than those who view from the angles. The same topic is echoed by Wiederanders (1970) who presents evidence to show the disadvantages for student learning for those who are seated outside of the "cone".

Metallinos and Tiemens (1977) reported the results of a study of TV newscasts with visuals on the right or left hand side of the screen. They found little support for the asymmetry theory position that viewers focus more carefully and readily on objects on the right side of the screen. Content appeared to be the more important factor.

Two studies have examined visual rate. Montgomery and Weakland (1969) reported that film was tested as normal, slow and slower rates with the audio held constant. Slower rates were more effective for learning. Schlater (1970) found that increasing the rate of video presentation will have no effect on recall of audio information. Exactly why these researchers thought that these would be interesting or important questions is somehow or other ellusive in 1980, perhaps you had to have been there.

INTER-MEDIA

Comparing effects of different media presentations to one another in terms of learning, attitude change, behavior modification, attention or some affective response has been the topic of a host of studies. The most perplexing problem facing all of these researchers is one of equivalence. To what extent are the two treatments which are being examined equivalent in terms of potential response. To what extent is the word cat equivalent to a meow? Both represent an animal. Are they equivalent treatments? Early researchers spent all too little time trying to control for equivalent treatments, more recent scholars have tried harder, though not necessarily succeeded any better. A second problem which all these studies have faced is the modality of measurement, and the bias of testing with printed words for equivalence or learning from messages which are presented without words. So many of the results may well be an artifact of the measurement mode. Conway (1971) has shown that it is necessary to test in the same modality which one is manipulating, or with some non-biasing response. Unfortunately, most of the research which has tried to compare across the media forms, or across the media modalities, have used cognitive measures which are biased towards word messages. Visual media can present words, certainly, but they present other phenomenon as well which have been seldom measured. When movement or spacial factors have been examined, they have been measured through a procedure which forces subjects to make an additional information processing transformation from spacial or color or movement relationships, to words which describe those phenomenon.

INTER MEDIA: PRINT VS. PICTURES

Pictures and words do not evoke equivalent responses among learners. Six studies support this proposition. This very generalized statement is indicative

of the difficulty researchers encounter who are seeking to compare print and pictorial stimuli. So much of the validity of the results is dependent on the control which experimentors employed in their studies. Jenkins (1968) reported that pictures produced a faster rate of concept learning than words did. The addition of incidental cues to words did not improve the effect of word learning. Brinkman (1968) concluded that editorials with cartoons produced more opinion change than either editorials alone or cartoons alone. Here the apparent equivalence problem was that cartoons and editorials evoked similar responses by themselves. Deno (1968) reported that pictures and words representing the same familiar objects do not function as equivalent stimuli in learning a set of language equivalents (i.e. Japanese). Generally, pictures facilitated the learning of equivalent language pairs, especially when the objects represented by the pictures were conceptually similar. Wicker (1970) reported that the presentation of a picture as opposed to a word is significantly better for cueing retention of associate words, but not for evoking associative words. This finding was echoed by Lynch and Rohever (1971) who noted that pictures facilitated the learning of associative tasks only when combined in presentation with sentences. Percy and Levin (1979) were interested in the durability of learning. They found that the addition of pictures to print increased learning (as compared to print alone) and this increase was maintained over a three day period for second graders. Since all of these studies have some problems with equivalence of the stimuli, we are unable to say with any assurance that a picture is indeed worth a thousand words.

INTERMEDIA: AUDIO VISUAL VS. PRINT

No generalizations are possible from the five studies examined in this area. Several studies found that print was superior, several studies did

not support this. Tiemens (1963) concluded that film which illustrated the practical applications of mathematics was more effective than comparable printed communications in motivating male students, though not female students. It is unclear how the two treatments were equivalent. Pinnock (1969) found no difference in Black's knowledge gain when comparing a film and bulletin for 4-H information. The control on this study was particularly problematic. The typical kind of comparison was offered in Browne's (1978) study. Subjects who read a version of a documentary were found to improve significantly more on factual recall than subjects who saw the movie version. Here the bias of the test makes the results difficult to interpret. A very fine study by Baggett (1979) got as close to developing structurally equivalent print and movie versions as we found in the literature. He concluded that recall of structural statements was very similar between a movie and a structually equivalent text version, but that recall deteriorated much faster with the text version compared to the film version.

A classic study by Krugman (1971) is also in this category. It is most often referenced because of its uniqueness and because of the high reputation of the author. Krugman reported that his single subject's brain waves responded more to differences in media (television vs. magazine ads) than to differences in content. Television yielded slow waves while the print messages yielded faster waves. This area of physiological response is in need of extensive additional research.

INTER MEDIA: AUDIO VS. VISUAL

Visual print information is superior to audio information for learning. Six studies lend support for this proposition, and six studies found either no difference or found audio superior. This proposition should be interpreted

with caution primarily because the weight of evidence is not entirely clear.

Support. Richardson (1966) reported that written speech is remembered better than an oral speech. Hanneman (1970) found that print captions are superior to auditory captions for identifying parts of an apparatus in a movie. Jensen reported that for delayed recall, visual information is better than an audio presentation. Linden (1970) found that visually presented sequential memory tasks were recalled better than audio presentations of sequential memory tasks. Ditcham (1979) found that a greater proportion of marketing information was picked up from the audio track of TV commercials than from video tracks. Menne and Menne (1972) report results which consistently support this proposition. They found that for learning lists of words, visual presentation alone was better than audio presentation or audio-visual presentation. Berman, Shulman and Marwitz (1976) also offer evidence of support; their subjects were least consistant in decoding presentations in the audio condition, compared to the visual alone or audio/visual combination.

Non Support. Hanneman(1970), for example found no significant difference between audio and print for teaching perceptual motor skills. Jensen, (1971) who found visual better than audio for delayed recall, found that for short term memory, that auditory was better than visual presentation for immediate recall. In a very specific situation such as television commercials, Sadowski (1972) reported that video events generated higher recall than audio events. The subject sample was rather limited for this study, however, Ditcham (1979) who also examined TV commercials and found the audio track better for marketing information overall found that subjects recalled significantly more information from the video portion of the TV commercial than from the audio portion.

One other study is worthy of note regarding audio and visual comparisons.

Zuckerman, Ziegler and Stevenson (1978) reported that attention of children toward TV is more strongly related to the visual track than the audio track.

In general it appears that learning will be enhanced if visual print information is offered rather than the spoken word alone, i.e., reading is the superior "learning" vehicle. Again the bias of measurement must be noted. In all these studies, printed words were used in the testing instrument. This no doubt biased the results in favor of visual print to some extent.

Nearly all the studies which compared audio to visual also made comparisons between audio alone and audio visual together, or visual alone and audio visual together. These results are particularly revealing, and straight forward.

Two modalities in combination (audio and visual) produce more learning than one modality. Seven studies support this proposition, three studies do not support.

Support. Audio visual presentations were found superior to audio only presentations for student learning by a variety of studies (Linden, 1970; Cammack and Richter, 1969; Nelson, 1951). Similar results were found by researchers who were comparing the audio visual television medium, to the audio only, radio medium (Westly and Barrow, 1959; Rue, 1955). Written and spoken combinations of presentations were found to produce more recall than oral only reports by two studies (Seiler, 1971; Richardson, 1966).

Non Support. Westly and Barrow's (1959) results which showed that television treatment caused more recall than radio treatment, disappeared after a six week period, when the two groups recall showed no significant difference. Menne and Menne (1972) did not find a superior learning score for audio visual presentation over visual alone. Finally, Nelson's (1951) subjects who both saw and heard the film did not perform better than those

who only saw the movie.

It does appear that the studies which had best control and fewest measurement problems were those which indicate that two are perhaps more effective than one.

INTER MEDIA: AUDIO VS. VISUAL VS. PRINT

Media vary in their ability to evoke effective or evaluative responses for their audiences. Five studies support the proposition.

A well controlled study by Anderson (1966) reported that statements equated in content but presented in different media (print, audio, pictoral) evoked different connotative meanings. Wisenborn (1969) found differences in perceived credibility ratings of a speaker which were attributable to the medium through which the message was presented (print, oral, visual, audio-visual). Nasser and McEwen (1976) examined various combinations of modalities. They reported that subjects were more highly involved with the presentation in print, than they were with the audio and print combination or video tape presentation. Machula (1979) study indicated that subjects who saw a video tape of a discussion preceived the presentation more favorably than did the audio group or the print group. Silber found that a film version produced an affective response significantly greater than slides, audio tape or control.

Precisely which medium produces the higher affective or evaluative responses is certainly unclear from these studies. We would expect that the topic of the presentation would have a great deal to do with which medium is most effective. As host of other factors are certainly operating here. One problem which rather permeates this line of inquiry is reflected in the otherwise excellent study by Nasser and McEwen (1976). Their video tape recording of a man reading a speech is labeled and consistently referred to as television. Such a visual

presentation of a speech people might expect to see in a classroom somewhere, but certainly not on their set at home. So many of the claims made on behalf of television, are based on visual treatments which the vast majority of viewers in the United States today would put in a different class of experiences. Nasser and McEwen (1976) found that the audio and print combination of their messages caused higher recall scores than audio alone or the print treatment alone. There were no significant differences with their television condition.

Machula (1979) found that people who listened to audio versions of a group discussion learned significantly less than the video tape or print group.

Wells et al. (1973) tested three learning concepts (tune lapse, space and motion) over three media (film strip, slide, still photos). They found that in general, different media are more or less effective at concept teaching depending on the concept and the medium it is paired with.

Several other studies have compared audio-visual and print media. The findings are not consistent enough to advance a summary proposition.

Hartman's (1966) excellent and complex investigation concluded that single channels and audio/print channels produce more learning on single channel sets. Verbal pictoral presentations gain in effectiveness where tested on some combinations rather than a single channel. He offers excellent evidence that the modality of the test is as important a consideration as the channel a message is sent in. In order to understand a medium's effectiveness you need to test in a similar information processing modality.

Franzwa (1973) noted that the addition of pictures to names did not interfere with learning but that the addition of names to pictures might interfere. The differences between the audio and print modes were obscure.

INTER MEDIA: FACE TO FACE VS. TELEVISION/AUDIO/VISUAL

Television presentations and standard classroom presentations do not differ in effecting student learning. Eight studies support this proposition; one study does not support.

A host of early studies examined the effect of television and film on student learning. Most of the studies which offer support are frought with design problems, primarily in controlling for the similarity in independent variables.

In the earliest study we uncovered in our search, Arnspiger (1933) found a significant increase in learning at the end of the term for students who had been exposed to educational movies during the course. Ulrich (1957) found no significant difference between lectures and camera facilitated visual aid presentations. Cutler, McKeachie and McNeil (1959) found N.S.D. between face to face instruction in terms of learning. Siebert (1959) also found no difference between classroom instruction and a second treatment group which was half classroom and half TV instruction. Atilano (1971) echoes these findings, reporting no difference between classroom with television, classroom with television and teacher, and home television viewing. Taylor, Lipscomb, and Rosewick (1969) found no difference between live lecture, video-taped lecture, and combinati video and live lecture. They did find some evidence that low ability students performed better under the combination treatment. Klapper (1959) reported results of a two year program which found TV instruction to be "as successful" as regular instruction in teaching English composition (i.e. N.S.D.). Bull and Ried (1975) reported video-taped police briefings did not significantly differ from live briefings. Swanson and Henderson (1979) found no differences among young children between TV modeling and TV modeling plus direct instruction.

Non Support. Kumata (1958) reported that TV instruction proved significantly better than live instruction, except for low ability students who did not learn more from the TV presentation. It should be noted that the TV treatment was a specially designed course which was highly visualized.

Two studies found that there are differences between televised and classroom instruction in terms of student attitudes. Klapper (1959) noted that student attitudes were more favorable to the highly visualized presentation. McMeramin (1974) reported that a television instructor (as opposed to the same instructor in the classroom) was viewed as less forceful. Poise was a perceived quality of the classroom performance, while empathy was a perceived quality of the TV performance.

Although a great deal of effort has been expended on this topic, the results inform us little as to the relative effectiveness of media focus. Seldom were any controls on visual presentation reported. When they were reported, the television treatment was a video tape of a lecture. How it was shot was evidently presumed to be unimportant. The most serious criticism of these studies is with the interpretation of the results. Null findings are regularly equated with support for no differences rather than a failure to reject a research hypothesis. In other words, the forms are equally "good" at effecting student learning. In nearly every study the failure to control for the independent variable's similarity render the findings of limited usefulness in unravelling differences between classroom instruction and mediated instruction.

COMMENT AND CONCLUSIONS

The study of channel effects and of production variables which operate

within various media has generated a great deal of research. Our category scheme for presenting the empirical research in this area is still evolving. There is overlap among several categories and some are not as useful as we would like them to be. The propositions which we have advanced based on these studies are perhaps sometimes too general to be of great value. We have included in the bibliography several studies which were not included in this review, since this paper is the first step in a larger project which will include research in audio variables as well as visual variables. We have included those intra-audio studies in the bibliography but have not addressed them in our summary.

Several conclusions occur to us having examined well over one hundred studies.

The dependent measure utilized in the vast majority of the examined research was some measure of learning, usually immediate recall. The result is that we are left with an inadequate understanding of the more important point of learning--comprehension. The extent to which people understand and utilize phenomenon presented in visual forms is not at all clear from the research measures of comprehension which allow respondents equal opportunity to report their understanding of both verbal-visual and nonverbal-visual data. Such measures are critical to assessing differences and similarities between measage presentations from different media.

We also need to understand more fully the evaluation responses to visual presentations: learning or comprehension between media presentations must be understood within the context of other perceptual variables. Several studies have shown differential responses to perceived credibility, attraction, evaluation, forcefulness and the like of visually presented speakers, actors, and newspersons. Future research should pursue rigorously differential

audience perceptions of media presentations. This line of inquiry should prove informative to both the information processing theorist and the media practitioner.

Further research must much more carefully control the independent variable set. A host of studies reviewed here has demonstrated that variation in production techniques does effect viewer or listener response. The itch to simply compare radio to TV to newspapers to classroom to telephone etc. should in most cases, simply be scratched. The difficulty, if not the impossibility, of creating equivalent messages in different media techniques render this approach of little value in most cases.

In addition, research in production technqiues and differential media forms must be sensitive to the viewing environment in which contemporary individuals operate. The modern American for example lives in a world inculcated with visual messages. The visual complexity, pace, color, form of modern television is a referent which subjects bring with them to any viewing environment...be it in the privacy of their own home, or the sterility of the University laboratory. The empirical research in visualization has an ever increasing burden to produce treatment material (independent variable manipulation) which are sensible to the sophisticated viewers who are their subjects.

Finally, we desperately need some theoretical formulations and programatic research. Salomon's (1979) work dealing with television and the process of learning for children is an exemplar in this regard. We salute this effort and hope that other scholars will follow his lead in theory building.

We are hopeful that a new flurry of research in visualization is on the horizon. Although there is a legacy of research in the area which we have

attempted to order in this paper, a great deal needs to be done and the past research may be of only limited usefulness. Research's only possible justification is to aid understanding of this tremendously difficult though extremely important topic as we continue our plunge into the age of telecommunication.

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